Math 126
Fall 2016
Dr. Lily Yen

Test 2

Show all your work

Name: _____

Score: ___/45

No Calculator permitted in this part. Read the questions carefully. Show all your work and clearly indicate your final answer. Use proper notation.

Problem 1: Evaluate the following integrals analytically.

a. $\int xe^{-2x}\,dx$

Score: /3

b. $\int \cos^3(\theta)\sin^8(\theta)\,d\theta$

Score: /3

c. $\int \dfrac{x+1}{x^2-2x-15}\,dx$

Score: /4

d. $\int e^{-3x}\cos(5x)\,dx$

Score: /4

Problem 2: Find the exact area of the region bounded between $y = 3x^2 - 3$ and the x-axis for x in the interval $[0, 3]$.

Score: /3

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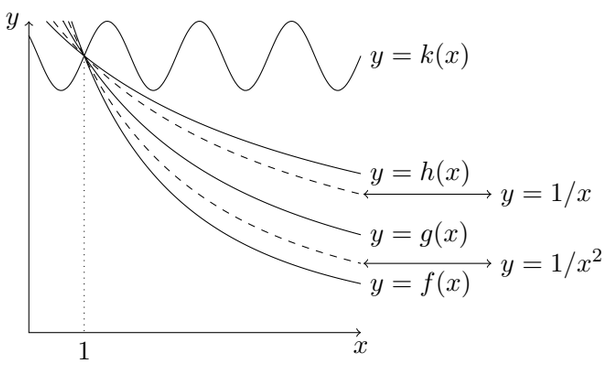
Calculators permitted from here on.

Problem 3: Determine analytically the convergence of the following integral.

$$\int_0^1 \frac{e^x}{x^2}\,dx$$

Score: /4

Problem 4: The graph of $y_1 = 1/x$, $y_2 = 1/x^2$, and the functions f, g, h, and k are shown below.



a. Is the area between y_1 and y_2 on the interval $[1, \infty]$ finite or infinite? Explain.

Score: /1

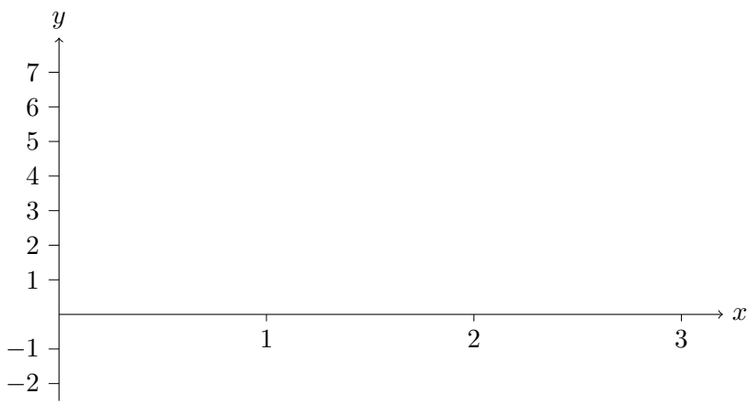
b. Using the graph, decide whether the integral of each of the functions f, g, h, and k on the interval $[1, \infty]$ converges, diverges, or whether it is impossible to tell. Reason must be provided for each correct answer.

Score: /4

Problem 5: A 20 m tall parabolic arch spans 50 m. Suppose a supporting beam is to be constructed across the arch at its average height. How high is the cross beam placed?

Score: /3

Problem 6: Draw $y = e^{2-3x}$ and $y = (x-1)^2 + e^2 - 1$ on the grid. Shade the region bounded between these two graphs in the interval $[0, 2]$.



Use integrals to express the following. DO NOT EVALUATE YOUR INTEGRALS. Draw a cross-sectional strip for each solid of rotation.

a. The area of the shaded region.

Score: /2

b. The volume of a solid that has the shaded region as its base, and cross-sections perpendicular to the x-axis are semi-circles.

Score: /2

c. The volume of the solid obtained by rotating the region around $y = -2$.

Score: /2

d. The volume of the solid obtained by rotating the region around $x = 3$.

Score: /2

Problem 7: Suppose the force, F, required to compress a spring by 2 cm is 0.8 N. Find the work done in stretching the spring from equilibrium by 13 cm.

Score: /3

Problem 8: A tank is in the shape of an inverted circular cone with height 5 m and diameter 4 m. The tank is filled with water to 3 m deep. Find work done to pump all the water out a valve 2 m above the top of the tank.

Score: /5